

METHOD FOR STORING INFORMATION AT ULTRA-HIGH DENSITY ON THIN FILMS OF BISTABLE MOLECULES

ABSTRACT

A method for writing information at ultra-high density on thin films of bistable molecules known as rotaxanes. The information is stored in a manner similar to an abacus, in the form of strings of pointlike structures of nanometer size (nanostructures) which are spaced uniformly. Writing occurs by means of a localized mechanical perturbation which acts only along the entire length of the string. The periodicity and size of the nanostructures are controlled by the thickness of the thin film, while the number of nanostructures along a string depends only on the length of the string. The process is demonstrated with two different sources of mechanical perturbation of the film: i) a tip of a force scanning microscope (also known as atomic force microscope, AFM); ii) an undulated stamp. The possibility to write nanostructures 40 nm wide, 1,5 nm high and with a periodicity of 100 nm. These values correspond to a writing areal density of 10-100 gigabits per square inch.

Figure 2

Forza applicata – Applied force

Punta AFM – AFM tip

Direzione della scansione lineare – Direction of linear scan

Profilo topografico iniziale – Initial topographical profile

Profilo topografico finale – Final topographical profile

Evoluzione del profilo topografico – Evolution of topographical profile

Figure 5

Periodicità – Periodicity

diametro – diameter

altezza – height

dimensione – size

spessore del film – film thickness

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Figure 6

Stampo – Stamp

Film sottile – Thin film

Pressione applicata – Applied pressure